

REMARKS

Reconsideration and withdrawal of the objections to and the rejections of this application in view of the amendments and remarks herewith, is respectfully requested, as the changes place the application in condition for allowance.

I. Status of the Claims and Formal Matters

Claims 1, 2, 5-26 and 28-32 and 38 are under examination in this application upon entry of the amendments presented herein. Claims 1, 5, 6, 14, 25, 28 and 32 have been amended, without admission, without surrender of subject matter, and without any intention of creating any estoppel as to equivalents. Original claim 4 has now been cancelled. New claim 38 has been added.

Support for the recitation “micromachined polymer scaffold” in claims 1, 14, 25, 28 and 32 can be found throughout the specification, for example, in paragraphs 75-77, and Examples 3 and 4, which describe the microfabrication process for polymer scaffolds of the invention. The term “polymer scaffold” is also used throughout the specification, in paragraphs 39 (page 7), 59 (page 13), 92 (page 22), 112 (page 27), 116 (page 28), 135 (page 33) and 141 (page 34) and interchangeably with the term “polymeric scaffold” in paragraphs 16 (page 4), 30 (page 5), 41 (page 8), 63 (page 14), 96 (page 23), 102 (pages 24-25), 103 (page 25), 113 (page 27), 114 (page 27) and 132 (page 32).

New claim 38 has been added, to recite that the pattern in the first layer of the multi layer device, which is suitable for the culture of endothelial cells, comprises microchannels that are 10 to 50 microns. Support for the amendment can be found in paragraph 134, page 33 of the specification.

As described herein, support for the amended claims and new claim can be found throughout the application. No new matter is added. It is submitted that the claims, herewith and as originally presented, are patentably distinct over the prior art cited by the Examiner, and that these claims were in full compliance with the requirements of 35 U.S.C. §112. The amendments of and additions to the claims, as presented herein, are not made for purposes of patentability within the meaning of 35 U.S.C. §§ 101, 102, 103 or 112. Rather, these amendments and additions are made simply for clarification and to round out the scope of protection to which Applicants are entitled.

II. THE REJECTIONS UNDER 35 U.S.C. § 103 ARE OVERCOME

A. Rejection of Claims 15-17 and 32-34.

Claims 1, 2, 4-26 and 28-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weiss et al., Vacanti et al., Mastrangelo et al., and if necessary, Cima et al, Marra et al. Applicants respectfully traverse the rejection.

The present invention provides a three dimensional system comprised of interconnected layers for cell growth. One or more layers of the invention will have patterned microchannels that enable physiological systems (e.g., vascular networks) to form. Thus, three dimensional systems of the invention provide the high resolution patterning that is required to mimic complex tissues and vital organs.

It is respectfully asserted that the cited references, taken either alone or in combination, fail to teach or suggest tissue engineered systems comprising micromachined polymer scaffolds.

Weiss et al. discloses non-microfabricated, low precision devices produced by standard polymer fabrication techniques, which are joined together by micromolded polymer attachment methods. Microfabrication is only indirectly referred to as a method to produce "barbs" or interconnects which join layers. There is no teaching or suggestion for a microfabricated polymer scaffold in Weiss et al.

Mastrangelo et al. merely provides polymer layers stacked on top of a rigid substrate. The polymers are etched, not molded, and therefore do not provide channels having the functionality of microfabricated channels. There is no teaching or suggestion in Mastrangelo et al. for microfabrication, much less a microfabricated polymer scaffold.

Vacanti et al. teaches methods of solid free-form fabrication, but not microfabrication. As a result, the resolution is a range which is comparatively much less effective for the construction of engineered tissues than the claimed invention. Vacanti et al. therefore fails to teach or suggest structures with high resolution (less than 250 microns) formed in polymer scaffolds by microfabrication.

For the §103 rejection to be proper, both the suggestion of the claimed invention and the expectation of success must be founded in the prior art, and not Applicants' disclosure. *In re Dow*, 5 U.S.P.Q.2d 1529, 1531 (Fed.Cir. 1988). There must also be some prior art teaching which would have provided the necessary incentive or motivation for modifying the reference

teachings. *In re Laskowski*, 12 U.S.P.Q. 2d 1397, 1399 (Fed. Cir. 1989); *In re Obukowitz*, 27 U.S.P.Q. 2d 1063 (BOPAI 1993).

The cited references, taken either alone or in combination, are silent with respect to microfabrication of polymer scaffolds. Thus, there is no motivation for the skilled artisan to look to the teachings of Weiss et al., Mastrangelo et al. and/or Vacanti et al., either with or without Cima et al. or Marra et al., to construct microfabricated polymer scaffolds, much less modify the teachings of the same to achieve the microfabricated systems of the claimed invention.

No where in the cited references is the need to produce high resolution channel patterns for improved physiology acknowledged. The cited references do not teach or suggest this modification of their systems and consequently, there is no incentive or motivation provided for the modification. Likewise, no reasonable expectation of success in achieving such a modification can be found in the cited references.

Moreover, to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981 (C.C.P.A. 1974). Here, the cited references fail to teach or suggest all limitations of the claimed invention. In particular, the combination of the cited references fails to teach or suggest a micromachined polymer scaffold. As such, the cited references fail to teach or suggest engineered systems that are capable of producing high resolution vascular networks. See paragraph 196 of the specification, demonstrating a resolution of 2 μ m in microfabricated polymer scaffolds of the invention. Thus, the engineered systems of the cited references lack the functional vascular networks and improved tissue structures of the present invention.

If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). Claims 1, 25, 28 and 32 are directed to a multi-layered structure having at least one layer comprised of a microfabricated polymer scaffold. Claims 2 and 5-24 and 38 depend or ultimately depend from claim 1, claim 26 depends from claim 25, and claims 29-31 depend from claim 28. As the cited references fail to teach or suggest the invention of claims 1, 25, 28 and 32, claims 2, 5-24, 26 and 29-31 are by extension also non-obvious.

Reconsideration and withdrawal of the rejections of claims 1-26 and 28-32 under 35 U.S.C. § 103 is respectfully requested.

REQUEST FOR INTERVIEW

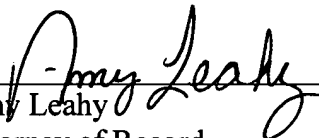
If any issue remains as an impediment to allowance, a further interview with the Examiner and SPE are respectfully requested; and, the Examiner is additionally requested to contact the undersigned to arrange a mutually convenient time and manner for such an interview.

CONCLUSION

In view of the amendments and remarks herewith, the application is in condition for allowance. Favorable reconsideration of the application, reconsideration, and withdrawal of the objections to and rejections of the application, and prompt issuance of a Notice of Allowance are respectfully requested.

Respectfully submitted,

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